AbstractID: 8925 Title: The use of a commercial multi-detector device for daily QA of linear accelerators

Purpose: With the increasing number of complex treatments there is a pressing need for QA tools that can help improve QA efficiency and comprehensiveness. The clinical use of a commercial multi-detector device for daily QA of linear accelerators is presented.

Method and Materials: The DailyQA 3™ (Sun Nuclear, Melbourne, FL) device consists of 25 detectors: 5 ionization chambers for flatness, symmetry, and output check; 4 curved ionization chambers for photon energy check by studying beam flatness; 4 circular chambers with inherent attenuators for electron energy verification; 4 sets of three diodes with 5 mm spacing for light-radiation coincidence check. During morning output check, the open 20x20 cm^2 field is formed by MLC in order to check the SMLC positioning. For DMLC delivery check, a slit with 2 cm gap is programmed to move across the detector array.

Results: With one exposure for each modality, we can verify that the output is within 3%, the symmetry (both axial ant transverse) and flatness are within 3%, light-radiation coincidence is within 3 mm, and electron energy is within 3%. The flatness is an extremely sensitive indicator to the change of X-ray energy. Our data showed that a 10% tolerance for X-ray energy was clinical acceptable, which translates to 1MV for 6MV and 2 MV for 18 MV. This meets 2% tolerance in PDD as recommended by AAPM protocol. The QA device is able to detect 1 mm SMLC error on a daily basis. The DMLC output typically is within 3%, which approximately translates to 0.6 mm leaf positioning/motion consistency. Combined with monthly picket-fence QA, it provides confidence in MLC positioning.

Conclusion: The clinical use of this multi-detector device has improved the efficiency and thoroughness of linear accelerator daily QA. Reasonable action level has been established by considering dosimetric relevance and clinic flow.